THE SUPPLEMENT TO THE

Tropical Agriculturist and Magazine of the C. A. S.

No. 3.] SEPTEMBER, 1912. [Vol. XI.

INLAND PLANTING OF COCONUTS.

An extract we published last month from the *Financial Times*, on the inland planting of coconuts, leads our experienced correspondent "B." to grapple with this fallacy, and also with some extraordinary calculations that the writer made as to the amount of nitrogen, etc., removed annually from the soil by the coconut palm. "B." also points out the conditions essential to the experiments referred to being of value, to prove that the yield of oil per nut is the same from palms grown inland and by the sea. What he further has to say regarding explosives, and the future explosive "Ergite," and their use in coconut cultivation and agriculture generally, should be of service to practical planters of this product.

B's LETTER.

July 13th.

Dear Sir,—In your last issue is an interesting extract from the *Financial Times* on the inland planting of coconuts.

The writer speaks of the "commonly accepted fallacy that the coconut palm must be planted by the sea, to thrive." I believe very few people in this island embrace that fallacy and a large majority give practical proof of a contrary belief by planting coconuts largely inland, where many of the best plantations are to be found. According to this writer, if the palms have "high illumination of the air, prevalence of winds, tropical heat, adequate rainfall, proper soil contents, and free underground mass-water movement" they will grow far inland. These are ideal conditions, not only for "growth" but for very profitable growth.

Now comes something very interesting. He says that 70 trees to the acre, yielding 80 nuts per tree per annum, that is 5,600 nuts, and 16 fronds per tree per annum, that is 1,120, remove from the soil annually ;

Nitrogen	..	400 lb.
Potash	..	600 lb.
Phos. Acid	..	185 lb.

In my note-book I find that according to the Philippine Journal of Science 3,000 nuts per acre per annum and 1,200 fronds remove from the soil:

	Nuts	Fronds		Total
Nitrogen	56·04	27·88	equal	83·92
Potash	57·09	65·[illegible]4	do	122·93
Phos. Acid	15·78	21·70	do	37·48

Will Mr. Bamber or any other Agricultural Chemist come to the aid of bewildered practical planters and explain this very great disparity? I may be pardoned for expressing the belief that the writer of the article under review has drawn on his imagination for his figures. I am not forgetful of the fact that the writer of the article gives the manurial requirement of nearly 1·87 as many nuts as the Philippine Journal takes account of; even then, the disparity is unaccountable. At 5,600 nuts the figures will be nearly :

Nitrogen	..	104·79 lb.
Potash	..	106·75 lb.
Phos. Acid	..	29·50 lb.

"Experiments made with 1,000 nuts obtained from palms growing along the sea shore and 1,000 nuts from palms grown inland seemed to prove that the yield of oil per nut is almost exactly the same." The experiment was not conducted as it should have been. The nuts should have been weighed in the shell, and their kernels should have been weighed before the extraction of oil. The general belief in the Island is, that nuts by the sea-shore have more oil than nuts grown inland. This is a subject worthy of investigation by the Agricultural Department.

Explosives are likely to revolutionise agriculture before long. The idea of exploding holes cut for coconuts, in hard soils, has occurred to many people. The subject has been discussed with me some years ago ; also the breaking up of hard soils in which coconuts are growing. The danger of handling dynamite and its high cost,

have stood in the way of its use so long. It was very interesting to read in your columns recently that a new explosive will be shortly placed in the market, called "Ergite," which will be safe to handle, cheap and effective. I predict for it extended use and a bright future if it possesses all the qualities claimed for it.

Deep cultivation of the soil, especially for coconut cultivation, is a recognised need. For the successful cultivation of coconuts, the soil should have large reserves of moisture for the roots to draw upon, especially during periods of drought. I have always advocated catch-water drains cut on a system, and a thorough cultivation of the soil on hard soils, so that as much as possible of the rain water that falls in them may be absorbed and stored for future use. Planters well know the difficulty in getting a hard soil cultivated to an appreciable depth and its high cost. If this can be done more *cheaply* with "Ergite," its effectiveness is beyond question; planters will use it largely.

Of course everyone will understand that explosions should not take place too near the coconut tree. Holes for the reception of the "Ergite" cartridges can be easily made with alavangus; or, where the soil is very hard, with steel jumpers, driven as deep as is necessary with heavy hammers. The distance apart of the drills will have to be determined by experiment. That is, it will have to be found out to what distance laterally each explosion will break up soil of different degrees of hardness.

I earnestly recommend those who have coconuts growing in hard gravel or cabook, to experiment on, say, 10 acres of the hardest and worst soil, and carefully to note results.—Yours faithfully,

B.

II.

(To the Editor, *Financial Times.*)

Sir,—Your correspondent's article on "Inland Planting of Coconuts" in your issue of 18th June opens up a very wide and interesting subject, also one that I imagine is likely to come under discussion more and more as the difficulties of obtaining suitable land near the seashore become greater. I would much like to see the region of coconut culture extended from the coast to the inland districts, and quite agree in the main with the writer of the article, although I do not know what "halophytic tendencies" are. The growth of the trees, the colour of the leaves and area of leaf surface are governed to a very large extent by the water supply. Surface drainage requires more attention than subsoil drainage from my observations, though, of course, the latter is of special importance also. I believe your correspondent to be perfectly sound in his views when he states that the chemically richer soils inland should really conduce to the greater productivity of nuts, but it appears to me to be of special benefit to the tree to be exposed as much as possible to wind, and to intense illumination. Having regard to this fact, therefore, it is not surprising that the natural habitat of the coconut palm should be close to the seashore.

It must be remembered, too, that the fruits it bears are too large to be satisfactorily dealt with by means other than water transport; on the other hand, the fact of being able to create conditions more favourable than is usually known to occur in Nature is more true perhaps as regards the coconut than it is of any other form of cultivation, and I am bold enough to affirm that there is no tree or plant that responds so gratefully to the treatment given to it. Although the figures quoted by your correspondent have a certain amount of interest, I think that, generally speaking, they are to some extent lacking in value, because when we come to the question of "transpiration" and "illumination" which are acknowledged factors to be reckoned with by those seriously interested in coconut cultivation from an economic standpoint, the laying out of an estate with 70 trees to the acre would only tend to militate in most cases against these all-important factors, but I agree with him that the yield in quality—i.e., outturn from nuts to copra—will be just as good from inland trees as from those on the seashore. If necessary, I could produce analyses to prove this point. The underground water treatment that he speaks of has a great deal to do with the heavy yields, but little, I think, with the size of the nut or kernel. There is no doubt in my mind that certain inland soils if properly treated should yield any investor a very handsome return, although he may have to wait a little longer for the first crop. The land, of course, should be well chosen with special regard to accessibility and easy transport. It has been proved to my satisfaction a fallacy to suppose that salt water from the sea has any influence worth talking about on the trees in its vicinity. The actual porosity of the soil no doubt has, and it is generally considered that the porosity of the soil is greater near the sea than inland.—I am, &c.,

Robt. W. Munro.

Banting, Selangor, F.M.S., 24th July.

—*Financial Times*, Aug. 20.

THE NEW EXPLOSIVE ERGITE.

August 31st.

DEAR SIR,—Last month, a letter appeared in your paper signed by "Agricola" *re* a new explosive "Ergite" to take the place of Dynamite.

Would you please let me know when "Ergite" will be available in Ceylon, and at what price?—Yours faithfully,

PLANTER.

[On reference to "Agricola" we learn that the new explosive "Ergite" is being patented in all parts of the world, and it is probable that a series of demonstrations will in due course be made in Ceylon. No statement can, at present, be made as to price, but the selling price will compare favourably with that of dynamite and the other high explosives.—A. M. & J. F.]

"OXALIS VIOLACCA."

MR. KELWAY BAMBER'S REPORT.

The Editor, "Ceylon Observer."

The Kachcheri, Nuwara Eliya, Aug. 19th.

DEAR SIR,—I am desired by the Plant Pests Board, Nuwara Eliya, to forward the accompanying report, on "Oxalis Violacca" by Mr. Kelway Bamber, for publication in your paper, for the information of those interested in this matter.—I am, &c.,

R. A. G. FESTING,
Assistant Government Agent.

Mr. Kelway Bamber's Report.

I am not aware how Oxalis Violacca originated or where, but it is very prevalent in several Upcountry districts, particularly Elkaduwa, where I have known it for ten years. It has been said to have originated in Hakgala, but I have seen no evidence as to this though it is prevalent in the district. Spraying with Sodium Arsenite, Muriatic acid, Salt solution, &c., have been tried without success, and the employment of poisons is too dangerous to coolies on estates where all the drinking water is from open springs and ravines. An experiment is being tried with frequent applications of nitrolin, when the leaves are wet, but no definite result has so far been obtained. Heavy mulching with grevillea leaves &c., is particularly successful, and similar thick mulching of infested areas with tea prunings and everything available should be tried. Where only small areas are affected, covering with old manure bags or jute hessian for a week or two, would rot the leaves. A second and third growth could then be allowed for a week or two replacing the bags before the new leaves are fully developed, and so exhausting the old bulbs and preventing the formation of new ones. The question of including the plant in the Plant Pests Ordinance was considered two or three years ago and was thought inadvisable as the cost of completely eradicating the pest where it is well established would be almost prohibitive. It would be difficult to apply for certain districts only.

It is said by some to cause a heavy loss of crop in tea, but others again state there is little loss and that only temporary. But while it no doubt temporarily absorbs much of the manure applied to the tea, this is given back again with added humus when the leaves decay, while loss of surface soil is also prevented in very dry districts; it dies back during the dry months, but the bulbs are not destroyed. The plant requires a fair amount of air and light and it is therefore less liable to cause trouble on tea estates where the bushes form a dense cover, assisted by green manuring shade trees. As on most well cultivated estates the bushes are covering the soil more effectually year by year, the risk of the plant spreading is likely to be reduced. It seeds freely, besides forming new bulbs, so it is important to pull the flowers systematically before the seeds can form and ripen. (Signed) M. KELWAY BAMBER, Government Chemist, July 25th, 1912.

ERADICATION OF LALANG.

BY MOTOR AND STEAM PLOUGHS.

In his report for 1911 on the British Settlement of Malacca the Resident writes:—

Few complaints of attacks of white ants or the presence of fomes were heard in planting circles. The eradication of lalang areas by various methods, viz., disc-harrowing, hoeing or the steam plough is of special interest. As between the disc-harrow and the hoe it is generally accepted that the latter method is the better; it is slower and more expensive, but the growth of the trees is far more rapid. In some cases both hoeing and harrowing have been successfully employed. Motor-ploughs imported for two estates proved expensive failures and quite unsuited to Malacca conditions, but the steam-ploughs introduced and used on Devon estates have been a great success both on account of the rapidity of the work, and the excellent growth of the young plants. The complete extinction of the lalang bugbear is a great achievement and a credit to those who have demonstrated it.

MR. WICKHAM'S RUBBER CURING PROCESS.

A SUCCESSFUL DEMONSTRATION IN THE KELANI VALLEY.

A successful demonstration of Mr Wickham's new Mocha rubber smoke-curing process has taken place in the Kelani Valley,and theColombo Commercial Co. now have a block of the rubber so treated. It resembles fine hard Para in appearance, but on being cut is seen to be finely laminated, each flake of rubber having been well smoked. The block produced is about nine inches or a foot square, and at the present time is not quite hard. This, however, will be attained in about a fortnight or so and then its appearance will closely approximate that of hard Para. The process is interesting. Latex is poured into a revolving drum, smoked and pressed. In the Amazon the smoking is done with fuel obtained from the palms. The palms, however,are different to those growing in Ceylon, but Mr Wickham thinks that the local palm tree will be quite suitable for his process. The machine at present is foot powered, but it is adaptable for belt drive. We understand that there is a possibility of a further demonstration in Colombo. Those who have seen both the rubber and the process are convinced that it is a good thing, and may have an important bearing on the plantation industry.

"TEA"—A POISON.

There is no end to the nonsense that is promulgated now-a-days. Here, for instance, is a letter which appears in the *Financial Supplement* of the London *Times* on Aug. 12th without comment, or reply as we have seen since :—

THE DUTY ON TEA.

(To the Editor of *The Times*.)

Sir,—In all the endless discussions we have had about reducing the duty on tea I have never heard any one point out that it ought to be taxed on very much the same grounds as justify the taxation of alcohol ; because, even if not an actual poison, it is at any rate a pernicious luxury, and to speak of it as a "food" is really too ridiculous. "If bad beer has killed its undreds, bad tea has killed its thousands." The Rev. W. Morgan.) "In the form and in the quantity now indulged in, tea-drinking ranks high as a source of much of the ill-health today." (Dr. Thomas Harrington.)

Let us at least give up the absurdity of classing it as a "food." Taken in moderation, good, sound beer is probably more useful as food.

" If wine's a poison, so is tea,
Though in another shape,
What matters whether one is killed
By canister or grape ?"

In self-defence I must add that I am in no way interested in "the trade," and have long since given up beer in favour of tea.

Yours truly,

ANGLO-INDIAN.

August 11.

—London *Times*.

The writer must have Brewery shares! He quotes a "Rev," who says "*bad tea*." Anything "*bad*" should be condemned and the "Dr.'s quotation does not describe" what "form" or "quantity" is injurious. Properly "infused" there is nothing less innocuous or no more beneficial drink than is afforded by *good* tea like Ceylon and Indian teas—the percentage to be condemned as "bad" being of the slightest. Not 5 even if 1 per cent ? Taken with sugar and milk, who does say that the drink is not a "food" and always, when properly made, a delightful, refreshing as well as innocent refreshment. Even "cold tea" is pronounced by Governors and sportsmen as the best drink in the world for the jungle.

TRUE PROBLEM OF AGRICULTURAL REFORM.

In the recent discussions of agricultural developments in the East; and Far East in general, and the propositions of the "model" and "small" farm in Ceylon, *Indian Engineering* contributes a very instructive article in its August number, dealing with the agricultural industry in India and the East, and the introduction of scientific cultivation. The article says in part :—

"The belief that there are portions of the world, and that India is one of them, in which the cultivator has only to tickle the earth to make it laugh out corn, has lately in more than one influential quarter, as well as in a limited professional circle, been advanced as a kind of reason why the more elaborate ploughing and harrowing machines which have come into general use in Europe should not be inconsiderately introduced into this country. It would be interesting to discuss how far if at all this belief has obtained a footing in the minds of agricultural experts who may have

any voice in the regulation and direction of the policy of scientific cultivation which an effort is rightly enough being made to establish in India; for it is of fundamental importance that the influence of this belief, which is far from irrational, should be intelligently controlled. If India is indeed 'an epitome of the whole earth' in presenting in different localities conditions which obtain almost anywhere else on the globe except the Arctic regions, the fact also presents the difficulty of realising variations in the treatment of conditions prevailing in different places, and as a preliminary to such realisation, a careful study of differential phenomena. From whatever plane Indian phenomena be studied, the truth is forced on all reflecting minds that study must precede action anywhere, not only because premature misdirection of effort costs money and entails loss of time, but also because it is very difficult to convey to self-opinionated reformers a true sense of their mistakes, and to secure a reversal of any course once set rolling. The fact is that the secrets of nature have not been sufficiently wrested by art to enable science to fathom the *rationale* of the processes by which nature recuperates herself; and though no farmer or gardener refuses the help of phosphorus or nitrogen in any form, which will increase his produce or swell his profits, the farmer and gardener, who have learned something of the way in which nature recuperates herself by rotation, secures both the results just mentioned in quicker time and at less than his competitor who flies to art while ignoring nature. The last point needing to be touched on in the present connection is the introduction of mechanical appliances into agriculture and even horticulture. How many of the practical experts and theoretical speculators, who have not merely endeavoured to study cultivation in its various aspects, but also dogmatised on the subject, have ever fairly realised the two facts that (*a*) the impulses under which reform invades any sphere usually give much of its whole future complexion and turn to any industry, and (*b*) that the preponderating impulse which has replaced manual labour with mechanical appliances in England has found its origin in the abandonment of rural areas for city life? Now this last fact does not exactly connote scarcity of labour, for the miseries of unskilled labour in London, Liverpool, Manchester, and Glasgow tell a different tale. But it does mean that rural areas have been depleted during the last century, which has witnessed the largest substitution of mechanical energy for manual labour; and that in this respect India differs, as poles asunder, from Britain. Mechanical industry is, indeed, owing to better pay, drawing crowds to factories and mines; but the supply is still superabundant; and, not only because commercialism is the dominant factor of modern industry, but also for deeper, political, social and moral reasons, somewhat different types of mechanical energy may be needed for India than some of those applied to Europe, nor may the proper extent of the substitution, and its true scope, as yet be safely considered a solved problem."

COCONUTS.

THE CONSOLS OF THE EAST.*

This publication covers more ground than any other publication on coconuts and refers to its cultivation in the whole of the Tropical World. It has besides special chapters on the manufacture of copra, catchcrops, subsidiary industries, manuring, prevention of pests, and last, though not the least important, the maintenance of health in the Tropics.

The foreword is by Sir W H Lever, Bt., who has very large interests in coconuts in the Pacific and elsewhere. He shows unbounded faith in the present and future of coconuts. The foreword should be carefully read and studied by all those who have any interest whatever in coconut cultivation. According to him, "the amount of capital required to become the possessor of a rich coconut plantation, should not exceed £10 or £12 per acre including every expense excepting the planter's own labour and interest on capital." This is not very explicit. Perhaps the worthy Baronet means the cost of planting up a coconut estate. Does he mean at the end of the first year or when? There will be a wild rush for coconut estates if people can become possessors of "rich coconut plantations" at £10 or £12 the acre.

A further inducement for would-be investors is his statement that "the net income to be derived from an acre of fully bearing cocounts would be £10 per annum." This too is too general. On what capital expenditure per acre and with what crops? I had always been asked by

* COCONUTS: THE CONSOLS OF THE EAST—with special sections on their cultivation and many illustrations by H. Hamel Smith and F A G Pape, with foreword by Sir W H Lever, Bt., London: "Tropical Life" Publishing Dept., 83-91, Great Titchfieldd Street, Oxford Street, W.

visitors to the Island from all parts of the world, what the profit an acre from coconuts was. My invariable reply was "That depends on what you pay for your estate, what the crops are and where the estate is situated with reference to cost of transport."

Sir W H Lever suggests that what Railway Companies do in Canada to develop the country, by supplying settlers with homesteads, the value of which is paid back after a few years, should be done in the Tropics. The Government should give grants of land, a little capital and a homestead for pioneers. What has our Government done? Mr Wicherley applied for thousands of acres of waste land in the arid Wanni. One would have thought that Government would have welcomed such an application and given the would-be pioneers all the encouragement in its power. What was actually done? A prohibitive price was asked for the land which effectually choked off the Company that was to be formed to pioneer where no one else would go and settle down, or at least acquire large acreages.

I will pass over the preface and introduction.

The first chapter is on "The Cost of a Coconut Estate," It has no local application and is therefore of not much interest locally, except for the purposes of comparison with the very elaborate estimate in the local publication "The Coconut Planters' Manual."

According to Mr L C Brown, Inspector of Coconut Plantations for the F. M.S., to open up 500 acres the expenditure in the 1st year will be $32,400. In the 2nd and 3rd year $12,100. The total expenditure till the end of the 9th year is said to be $137,060 or about $274 per acre. Crop at 10 nuts per tree is estimated from the 6th year. The income from the 6th—9th year is estimated at $117,440. Deducting income from expenditure, the cost of the estate at the end of the 9th year will be $19,620 or a little over $30 the acre.

I need not weary your readers with the details of the cost of opening an estate of 500 hectares in a German Colony.

A few pages are devoted to a statement of comparative values of coconut and soya bean products at the beginning of April, 1912. Your readers will not thank me if I give them these details. Soya bean as a dangerous competitor of coconut was a bogey that alarmed not a few a couple of years ago. It is laid at the present time.

Who was it that stated authoritatively last year that capital is being driven from Ceylon to the Straits owing to the encouragement offered Planters there? Was it Mr. Arthur Lampard? Read what Mr. Hamel Smith has to say:—"For some reason or other Ceylon especially has been a favoured child of fortune, and capital and enterprise have preferably gone there to the detriment at times of other regions, which are, in themselves, equally, if not better, favoured by Nature. The reason may lie in the charm of the land, but the thoroughness and enterprise of its European Planters, certainly, has a great deal to do with this, as was the case when the same man started to plant up Malaya with Rubber." Most right-thinking people will heartily endorse this estimate of the European Planter.

I feel very highly flattered that my paper on coconut cultivation contributed to the Agricultural Society appears in its entirety in Mr Hamel Smith's book with a few introductory words and foot-notes: "We quite agree with all Mr Beven says, but there are many who maintain that to cultivate, the roots must or may be, disturbed or damaged, and through them the tree." It is not possible to cultivate the soil without disturbing or damaging the roots of whatever trees grows on it, "and through them the tree." This is true of almost all "trees" but the coconut. If anybody takes the trouble to carefully observe the root-growth of the coconut tree, he will notice that the bole of the tree is constantly throwing out new roots. The damaged roots of a coconut tree always die back, but new ones replace them at once. Where the soil of a coconut estate has not been disturbed by ploughing or tilling, it will very often be found that the first ploughing or tilling will give the trees a shock and will throw them back. But this is temporary. To give the trees as little of a shock as possible when applying manure, I always advocate leaving a space of two feet immediately round the tree, intact. The new roots within that area at once take the place of the damaged ones and minimise the shock induced by cutting the roots.

On page 48 is a specimen of a young tree in Klanang estate carrying 360 nuts. It is splendid as a specimen. I have seen trees under 10 years old in the Puttalam District carrying as good if not better crops. What I do not like in the illustrated tree is that it is tapering too quickly. That is not a type of a tree that will grow up to be heavy bearing.

The experience in Ceylon is not that copra in the sun takes five days to dry and in the grill 10 to 12 hours. In a critique I published recently in your columns, I said that though many

people dried copra in the sun in five days, a thorough drying occupied seven days. But no one in the Island dried copra in grills in 10 or 12 hours!

The following table is very instructive :—

1 gallon oil weighs 9 lb 4 oz.
40 full-grown nuts yield 1 gallon oil.
12½ gallons oil or 500 nuts yield one cwt. oil.
250 gallons oil or 10,000 nuts yield one ton oil.
170 to 200 nuts yield one cwt. copra.
3,700 nuts yield one ton copra.
3 nuts yield one lb desiccated nut.
45 lb copra yield three gallons oil or 61·8 per cent. of total when extracted by "chekku."

Under hydraulic pressure perfectly clean, ripe nuts should give 66 per cent oil and 34 per cent poonac —at least, that is, in theory. In practice it works out at 62·5 per cent and 37·5 per cent.

The above is in an article on Coconut Planting in the West Indies. Mr Hamel Smith's remarks on the above are that large soap manufacturers say that at least 5,000 nuts go to a ton of copra as three nuts go to a lb. of desiccated nut "The difference in loss of weight between coprah and desiccated nut in far too small for it to be necessary to use only 3,700 nuts in the one case and 6,720 in the other."

Mr W R Westland returned from Papua last year. He called on me and I gave you the results of a conversation I had with him on coconut planting there. A special chapter is devoted to Papua in the book under review. The trees are said to start bearing at five years, and to bear heavily at 8-9 years ; 3,000 nuts yield ½ a ton of copra and healthy trees will live at least 60 years. The estimate for opening 500 acres is : first year £2,700, 2nd to 5th year £3,750. Total expenditure at end of 6th year £13 per acre or £6,450. It is surmised that this is exclusive of superintendence. There are other estimates given which it is unprofitable to give. In the 7th year the yield should be 40 nuts per tree; in the 9th year 60 nuts. This is not an extravagant estimate on a rich soil and with systematic cultivation. Catch crops are recommended to reduce capital expenditure. Unfortunately this is not practised in Ceylon except under the "goiya" system. Catch crops will necessitate the land being kept clean and the soil stirred and in good tilth. The result will be that the coconut trees will come into bearing 2 or 3 three years sooner than under the present system.

There is a very interesting chapter on coconut planting in the Philippines. As is well-known in this Island, coconut cultivation in the Philippines is carried on on scientific lines. "In spite of drawbacks, the Philippine exports in 1909 place the Islands easily first of all centres, as a producer of coconut products. During 1909, 232,728,116 lb. of copra and 364,788 gallons of oil were exported." Possibly the poonac was consumed locally by stock.

I have suggested a subsidiary crop between the coconut plants on new clearings. This will keep the land clean, will improve the tilth of the soil, will consequently help towards the growth of the plants and will yield an appreciable return. A disc-harrow is said to be a good implement to keep down weeds and grass. Mr. Westland showed me photographs of these in use in Papua drawn by mules. Unfortunately our coconut estates in Ceylon are not cultivated as they should be. We do not resort to labour-saving implements.

Here, too, we find the groundless fear expressed of injuring the roots of the palms if ploughing be done nearer than 5 feet from the base of the palms.

I suggested many years ago that the fronds of the palms should be buried, after cutting off their butt-ends, which can be burnt. Fires at nights on Coconut Estates check insect pests, as these are attracted by the fires and get burnt. Barrett suggests the leaves of the fronds being used with husks, weeds and dead animals, &c., for compost heaps and the midribs being buried.

In Ceylon, Sinhalese families are housed on different parts of the estate, but the members of these all work together. "On a well-kept estate, one man can look after 20 to 25 acres." Will it not be a good thing to adopt this system in Ceylon and get a family to do *all* the necessary work on a given area. "One man can husk 2,000 nuts a day, or rasp the meat from 1,000." What is this latter operation ?

An estimate for opening up land is given. I would suggest to you, Sir, that a comparative statement be prepared of the cost of opening an equal acreage of land in Ceylon and elsewhere and it can be made an appendix to the latest edition of your publication on Coconuts.

Illuk costs much money to eradicate and is a source of much worry to planters who have not a sufficient labour supply to tackle it. The English "Jumbo" type plough is said to be the best to eradicate this pest.

Manihot Glaziovii for normal tropical climates.

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In the Philippines, as in many other parts of the tropical and sub-tropical world where coconuts are grown, 30 feet by 30 feet is suggested as the proper distance to plant coconuts. The reason for this as given in this chapter is curious. "In order to obtain the maximum number of nuts from each tree, it has been found necessary to guard against the branches of some trees touching or overlapping those of the other trees. This prevents the free circulation of wind through the palms. The continual movement of the branches of the coconut palm is absolutely necessary to its normal functions." In Ceylon, the usual distance is 25 feet by 25 feet. A gentleman noticed that when planted at this distance the branches of the young palms were interlaced. He therefore planted his estate 30 feet by 30 feet. As the palms grew older their fronds became shorter and drooped down. The sun had full play on the soil and dried and corked it. The trees suffered during periods of drought. A comparison of the trees growing on the opposite side of the road and planted at 25 feet by 25 feet with these, is an object lesson. In Ceylon there are very few places that I know where the palms should be planted 30 feet by 30 feet apart.

The following is strange advice: "If you have good, deep, rich soil, plant cacao, rubber or such crops; but if you have areas of poor soils plant coconut plants on them."

In the chapter on Coconuts in Samoa and New Guinea, *Mimosa pudica* is said to be the best plant to cover the soil of coconut estates, owing to its nitrogen gathering properties and owing to its containing 20 per cent of proteins.

The question of how to plant seed nuts is discussed, and preference is shown to their being planted on their sides, as I have always practised and advised, and for the same reasons.

In Samoa the average yield of a palm is said to be 60 nuts per annum. This is not a high average on a rich and volcanic soil. The nuts must be of poor quality if it takes 6,000 nuts to make one ton of copra, or 1,500 nuts for a candy. The reason given for allowing nuts to ripen on the trees and fall, is curious. The trees are damaged and unripe nuts unfit for copra are picked. "The flowerstalks, &c., are also bound to suffer more or less from handpicking." Recently, Mr. J. D. Vanderstraaten started a discussion on copra-drying which unfortunately was not taken up by experienced planters. I attempted to describe a kiln said to be in use in German Samoa, as described to me by Mr. Fredrick Burchardt. Here is a more complete description of it:—"A lower masonry structure (18

feet long by 7 feet high) contains heating pipes made of sheet-iron (2 ft. diam.) laid lengthways. These pipes have a furnace at one end and a tall smoke stack (25 ft. to 30 ft.) at the other. The masonry walls carry a broad spreading floor, with a roof over the whole, whilst over the pipes is a system of hurdles of a handy size 4 feet by 2 feet, numbering as many as 200, on which the coconut meat is laid. Fresh air and the necessary draught is admitted by means of small holes through the lower part of the masonry."

The difference between the kiln as described and illustrated to me, and this is that the flues in the first instance were said to be placed zig-zag fashion and the first flue was of masonry. The fresh air was admitted between each row of trays by long horizontal openings in the back wall.

This kiln is said to have a capacity of drying 1,700 lb. of copra in 24 hours. As I have said already on this subject, the kernels have to be detached from the shells in strips before being put on the drying trays.

In the chapter on German East Africa occurs a passage which will afford food for thought to the Hon. Sir Christoffel and the Government at the present juncture. "The negro a native black, is inordinately fond of intoxicants, and the easiest way to satisfy this craving is to tap the coconut palm of its sap, which when fermented, yields a very potent beverage, pleasant to the palate of the African worshippers of Bacchus."

There are several chapters on clearing and preparing land for planting Seed-nuts—nurseries, Laying out Plantations, Care and Upkeep, Diseases, describing at length the bleeding disease and quoting largely from Petch. The chapter on diseases is very comprehensive.

To me, an ardent Agriculturist, the Chapter on Manuring is the most interesting and valuable portion of this book.

A table is given showing the quantities of manurial constituents to be found in the husk, shell, meat and milk of a coconut. Taking 7,000 nuts as the yield of a hectare (2½ acres) a table is given of the quantities of Nitrogen Phosphoric Acid and Potash removed by the above crop and by the leaves :—

Annual Loss.		Nit.	Pot.	Phos. Acid.
Nuts per Hectare	Kilos	59·43	60·55	16·73
Leaves	"	31·69	74·82	24·65
Total Loss	"	91·12	135·37	41·38

I will not concern myself with the manurial ingredients required for the formation of the leaves. In my manuring operations, I always endeavour to return to the soil only what the crops remove, and allow the soil to yield sufficient nutriment to the tree to form the fronds, &c. Well, taking 3,000 nuts as the yield of an acre of coconuts, and a kilogram to equal 2·02 lb., I find that they remove :—

	lb.
Nitrogen	47·12
Phos. Acid	14·48
Potash	52·41

These figures are from the 'Philippine Journal of Science.' I have figures taken from the same Journal some years ago into my notebook which differ somewhat from this :—

	lb.
Nitrogen	56·04
Potash	57·09
Phos. Acid	15·78

"Both in very fresh and over-ripe nuts, there is a considerable deficiency in oil. Whilst there are individual variations among nuts from the same tree, analyses showed very conclusively the increase in the percentage of copra and oil as the fruit becomes riper. The average percentages of copra and oil in the green nut are only 11·5 and 7·5 respectively, but they rise to 21 and 13·6 in the fairly ripe and assume a maximum of 23·4 and 15·5 in those which had been allowed to ripen on the tree."

The following table is very interesting. I feel sure that those of your readers who are interested in coconut cultivation will be thankful to me for producing it. They are particulars of 1,000 nuts from trees on the sea shore and inland and allowed to season for a month :—

	Sea-shore Nuts		Inland Nuts	
	kilos.	per cent.	kilos.	per cent.
Weight of 1,000 nuts	2,363	100·0	2,286	100·0
Do husks	897	38·0	703	30·8
Do nuts less husks	1,466	62·0	1,582	69·2
Do meat and shells	929	—	979	—
Do milk	557	22·7	603	26·4
Do shells (dry)	282	11·9	291	12·7
Do meat	647	27·4	688	30·1

According to this table, inland nuts are superior to seashore ones.

SEA-SHORE NUTS.

	Sun-dried.		Grill dried.	
	Kilos.	Per cent.	Kilos.	Per cent.
Copra ...	302	12·8	330	14·0
Oil ..	182	27·7	198	8·4

INLAND NUTS.

	Sun-dried.		Grill dried.	
	Kilos.	Per cent.	Kilos.	Per cent.
Copra ..	322	14·1	333	14·6
Oil ...	191	8·4	189	8·3

All the preceding is preliminary to what follows on manuring. We are told that Nitrogen 30 lb., Phos. Acid 45 lb., Potash 45 lb, Lime 30 lb. is "a fairly reliable formula per acre." How these figures are arrived at is not vouchsafed to us, but they are quite inconsistent with what I have quoted previously from this book.

On the vexed subject of salt, it is stated that on light soil, salt is positively injurious. What of the sea-shore? It is stated further that the coconut palm is able to take up large quantities of salt. No tree will take up in large quantities of what is harmful to it. I am a great believer in salt for inland coconut plantations, not only because salt forms a large percentage of the constituents of the products of the tree, but also because it is a digester of the soil and helps to keep it moist owing to its hygroscopic properties.

The writer of the article on Manuring holds practical views as regards artificial manures. To begin with no manure is "artificial." He says that "unless care be exercised in the use of artificial manures it may be attended with a heavy and unnecessary outlay without corresponding returns." That is contrary to the general experience in Ceylon. He suggests that materials locally obtainable will, at the start, suffice. I wonder what estate in the Island will have on it sufficient material to be used as manure, so as to be independent of outside manure? "The coconut tree thrives best where the soil is well provided with Potash, Nitrogen, Phosphates, Lime and slightly saline substances. All these are, without exception, available on a plantation in ninety-nine cases out of a hundred." Such estates are well worth owning.

The growing of leguminous plants to add humus to the soil, is suggested, as also the formation of compost heap. Artificial manures are said to have most effect on young palms. In Ceylon young palms are not manured as a rule. Backward plants receive a small dose of kainit or ashes and occasionally a basket or two of cattle manure. The opinion expressed in what is termed "rational coconut cultivation" is sound. Find out what constituents of plant food are wanting in the soil and supply them. The same cannot be said of the advice given to apply a stimulating nitrogenous manure in the early stages of the career of the palms. It is better to apply half-a-dose of manure annually than a full dose bi-ennially, but the cost will be nearly double. If manure be applied annually, it will be advisable to manure one-half of the tree each year.

It will be news to Ceylon Coconut Planters to be told that in Ceylon systematic manuring with cattle is practised. The *modus operandi* is described. One head of cattle is kept for 2 or 3 acres. The principal food is poonac. At night the animals are kraaled and bedded with thick layers of straw, frequently added to. After 6 months the kraal is shifted and the manure made is used with bone meal and other manures to be worked into the soil. The dung from 100 cattle suffices for 10 acres; 1,000 head of cattle will be required on a "good sized plantation."

On the authority of Mr. W. Freudenberg it is stated that after a series of yearly manuring, a ten-year-old estate gave an annual crop of 80 nuts per tree; when it was unmanured it gave 50 nuts per tree per annum. Where I wonder is this grand estate?

The figures given of the manurial constituents removed from an acre both by crops and what is required for fronds and the nourishment of the tree, are not in accord with the figures I have in my note-book.

Two manure mixtures are suggested. I will deal with No. 2 which provides for larger doses than the other.

Sulph. Ammonia	...	120 lb.
Bone Meal	...	200 ,,
Superphosphate	...	60 ,,
Kainit	...	100 ,,
Muriate of Potash	...	70 ,,
		550 ,,

I will compare this with the requirements of 300 nuts according to Cochrane:—

		Mixture.	3,000 nuts.
Nitrogen	...	31· lb.	50·25 lb.
Phos. Acid	...	72·40 ,,	21·64 ,,
Potash	...	55·30 ,,	101·25 ,,
Salt	...	35· ,,	63·75 ,,

It will be seen that in the mixture suggested there is a very great excess of Phos. Acid and a deficiency of the other constituents. A strange reason for this mixture is given. "These mixtures are based on the information gained from experiments on orchards!" Compare the above with Mudaliyar A E Rajapakse's mixture which is commended and is said to have increased the crops from 22 nuts per tree per annum to 51 nuts per tree per annum.

Nitrogen per acre	...	36·72 lb.
Phos. Acid ,,	..	105·12 ,,
Potash ,, ,,	...	66·96 ,,
Salt ,, ,,	...	75·60 ,,

SALES OF PRODUCE IN BRITISH AND CONTINENTAL MARKETS.

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A beautiful coloured photographic illustration is given showing nuts whole and in sections of manured and unmanured trees.

The experience of all local coconut planters has been that if an estate had been neglected the first application of manure helps to improve the condition of the trees. A second application should follow a year after to secure crops. This advice is given in the book under review.

Manure mixtures are suggested for "sand or loamy soils," "loamy soils," "clay soils." It will serve no good purpose to analyse each and will occupy too much of my time and your space.

MULCH.

A chapter is devoted to this very important and much neglected agricultural operation. "Tilth, mulch and microbes" should be the motto of modern agronomists. The neglect of mulching, which is called the "fundamental principle of plant cultivation," is much regretted. Mulching can very easily be carried on, on all coconut estates, immediately after the application of manure, so as to keep the soil free and moist and to permit of unarrested root-action even during dry weather. The material is at hand in weeds or fronds. Husks are also used, but this work costs much in transport and arrangement of husks. If the soil be kept in a proper state of tilth, it acts as a mulch and permits of the action of microbes.

I will, as time permits, continue spasmodic reviews of this book.

B.

RUBBER NEWS FROM CEYLON.

Mr. Wicherley writing from Ceylon to *The Rubber World* says :—Mr. R M Lyne, the new Director of Peradeniya Gardens, has settled down to his great task which the Island agriculture presents for him. He is apparently a very hard, enthusiastic worker, and is certain to make a good record in Ceylon. I had a very interesting chat with him the other day. He found "The Whole Art of Rubber Growing" somewhere on the East Coast of Portuguese Africa, and I discovered him to be a genial endorser of all the good things written about Ceara. Among other things, Mr. Lyne suggested "coppicing" Ceara every year. He would grow it very thickly, and when the plant is one year old cut it down to a 3 ft. stump, and put the whole lot through a macerator, afterwards recovering the rubber. I am going to try it on an acre of ground at once and shall be interested to know what macerated Ceara is like.

A Company has started a factory here for decorticating Para Rubber seed. I am much interested in the venture. The price offered estates for waste seed is £3 per ton, but I am told they want nearer £20! Perhaps when "Perkinette" swoops down upon them, estate Agents will be glad to sell it, if only to help to pay the coolies rice allowance. (This is not a joke.) But the exploitation of waste rubber seed, on the other hand, has universal attractions for the native for whom nothing

is too small or too insignificant so long as he can see a profit in the handling of it.

Mr. Wickham is here with a coagulator and a new tapping tool for Para rubber. He invited me to inspect the latter at his hotel the other day. It is a very ingenious tool. Designed to do away with all bark removal, it is constructed to follow as near as possible the work performed by the Brazilian seringueiro in tapping his trees. Into a steel frame three chisel head blades are fixed, 1 inch apart, in a perpendicular position. A back spring controls the action of these chisels, which incline at an angle of 45° in the frame. The tapper is armed with a mallet, and when the tool is placed in position, he gives the back spring a sharp blow, the chisels make three incisions after this style :

the milk being allowed to flow down the trunk. I am afraid the Ceylon planter will not take on the thing very readily, inasmuch as it must increase enormously the output of "bark-scrap," which is already an abomination on young plantations.

Quite a craze has recently set in for thinning out three and four-year-old Para plantations throughout Ceylon, where it was the rule to plant about 220 trees to the acre. I was on an estate the other day where fine four-year-old trees full of milk lay on the ground as thick as leaves in Vallambrosa. Half the plantation was grubbed up. The superintendent informed me that it was done by the agent's orders. Trees were not to stand in future closer than 100 to the acre, and the company had no money to spare to find labour to tap the trees to death.

Many of the old proprietary planters condemn it unreservedly. They point to their 200 per acre trees yielding 300lb. of dry rubber to the acre, and protest that nobody in the Island is anything but a mere infant in knowledge as to the correct way of growing and tapping Para rubber, and it will take years before anyone can pronounce definitely on the matter one way or the other.

ELECTRIC POWER IN CEYLON AND ELSEWHERE.

OUR ISLAND BEHIND THE TIMES.

The vast possibilities of engineering development in Ceylon have frequently been pointed out in our colums, but further than an investigation, and a brief report on the matter, little has been done. This is to be greatly regretted for other countries are stealing a march on us in the development of their waterpower projects, and among them, one of our neighbouring island colonies in the Orient, that of the Philippines. Through H.M. Consul-General at Manila, we learn that a company has been formed there with a capital of £153,000 for the purpose of generating electric power from the Agno river, for supply to the mining plants and saw mills on the river, and for the lighting of Baguio, the summer mountain capital of the Philippine islands. This is a remarkable undertaking, in view of the fact that they have no such falls as we possess in the Elfin, and other falls in Ceylon, and will have to construct a dam system to secure the needed precipitation and power, while here we have a natural water-power of great and useful force if properly harnessed. Both the Japanese, and the Dutch government in Java have been making exhaustive investigations into the natural generating powers of their respective waterways, and extensive projects are now under development by them, as well as in Australia and New Zealand. In view of the above, it is interesting to reproduce at this time, what we recently wote and which might be again seriously considered by Government and some enterprising firm in Ceylon, with a view of undertaking the development of our natural waterpower without further delays. The article says in part : Nature has so designed Ceylon as to make of it a very playground for the engineer as well as the tourist. The enterprising planter has made the land a source of riches. It promises by the help of the specialist in civil and electrical engineering to become a profitable wonderland. But both planting and public works of the kind that we have in mind require heavy initial expenditure before rewards can be reaped. The planting industry has been able, generally, to get the requisite capital. When it comes to a question of great public works that open out immense possibilities, we find many and curious difficulties in the way of financing them sufficiently. Government is in a chronic state of having no funds to spare. Sources of revenue are fairly restricted,

and it is difficult to find new ones certainly new ones that would win general approval.

Now, the configuration of the island of Ceylon, and its meteorological conditions, are such that it seems to hold immense possibilities for the hydraulic and electrical engineer. Of course, before this point can be finally determined, there must be extensive and exhaustive surveys, and, as has already been remarked, before reward can be secured, considerable expenditure will have to be incurred. This idea of utilising our mountains, and the waste water power that now rushes down their slopes, and plunges over their precipices, is, of course, not exactly new. Mr. Coryton Roberts, and one or two others, have gone somewhat deeply into the matter, and the subject has been ventilated in the columns of the press in a spasmodic fashion. There are few who will dispute the manifold advantages that would result from the possessing of an abundant and cheap supply of electric power. There is none, having before him evidence of what has been done in Mysore, in the Bombay Ghats, in the Punjab, and, above all, in Austria, Switzerland, Sweden and Norway, who will deny the possibilities, and manifold benefits of an extended hydro-electrical scheme, or a series of schemes, for the Colony.

It would be not only possible, but desirable, nay, essential, to combine, at least in part, our irrigation and hydro-electrical schemes. The water flowing to the fields would be harnessed as it issued from the reservoirs, and be made to lend its energy to man, as well as its refreshment to fields. This would be perfectly easy. With the newest and most perfect turbines, the maximum of energy can be secured from quite moderate falls. Turbine pits can be established in localities where the surface slope is very moderate. We have lakes in our hills. These can be increased in number, and their spill-water employed with profit. We have water-falls. These ought to be harnessod. Where, as is frequently the case in tropical countries, the streams that flow over them diminish greatly in tho dry season, the Civil Engineer will generally have little difficulty in arranging to supplement them, and in creating reservoirs to secure a sufficient perennial supply. Where great works cannot be built, several small ones can be established and linked up. What is first required, however, is the earnest desire. This would be followed by the making of what we may style a hydraulic survey on a very thorough scale. This would give us the information we require as to the water supply available, and the best means of storing water and leading it to the places where it will do the maximum of work. When this is done the rest will follow, first the funds, then electrification of our railways, or at least the mountain sections, electric light for all towns and their suburbs, and electric power for a hundred new industries.

FIFTTY YEARS OF CONTINUOUS CORN GROWING.

The *Contemporary Review* for August published an article in this subject which has evoked a long letter from our esteemed correspondent whose *nom de-plume* is appended and who says much on "artificial manuros," politics in the home country, Continent of Europe and Colonies. We do not subscribe, but give as follows, on the principle of "*audi alteram partem*":—

"At last, by fits and starts," I have managed to get through the "Contemporary." I seeyou ask my opinion so far as one article is concerned, and so, if I can keep it up, I will refer to some of the other articles. The one you specially refer to is "Fifty years of continuous corn growing," which I read with much pleasure, for I had not heard of the experiment which has now arrived at its jubilee so successfully. You ought to know, by this time, that I have no objection to

"ARTIFICIAL MANURES,"

so long as they can be got pure and at a price that would leave a profit. But I do object to paying too much for bad artificials and bones that are the skeletons of diseased animals. There is no doubt that anthrax and other diseases which crop up without, apparently, rhyme or reason, in this country, are the result of diseased bones, chiefly from India. In New Zealand only three cases, I believe, of anthrax ever appeared in the country, and they were traced to a shipload of bones from Bombay, since when no bones can be landed in New Zealand *from any place*, except at Auckland and Invercargill, and there they go through an expensive disinfection for which the importer is charged £1 per ton. My support of

CATTLE MANURE

or better still sheep manure, from sheep fed under cover, is that one runs no risk of imported diseases, and by feeding the animals highly one can make the manure far more valuable and

finish the beasts more quickly. At the farm in Hertfordshire, no doubt, all sorts of care has been taken, and I can see no reason why the result should surprise one, as doubtless, they kept analyzing the soil and thus were able to feed to the soil the chemicals which it required. But you must not run away with the idea that the same result could not have been attained by using ordinary farm manure, unassisted by any artificial. You probably know that potatoes are the severest and most poisonous of ordinary British crops.—(tobacco, of course, is the worst of all,) well, I have been 24 years on my farm, and have grown

POTATOES

on the same ground year after year, without any artificial, but only a fair manuring from the byres. One year I added kainit to a small patch, to see what would be the result, and on that spot I not only had the worst crop, but scarcely a tuber at the roots. Three years ago I broke up a 15 acre field from lea, which had never got anything but cattle manure from me. First year 56 bushels per acre of oats; 2nd year 58 bushels per acre of oats; 3rd year 62 bushels per acre of oats. This year it got 25 loads per acre farm yard manure, and the turnips now growing on it are as good as I could wish. It will get no more manure till the next time it is ploughed, in the course of cropping. I run it out that the value of manure,—price at which I could sell it at,—and the carting out and labour comes to £4 7s 6d per acre. To do the same with artificials would be nearer £7 per acre and the result of crop, a more precarious one, not so bountiful and, certainly, not so good for the animals that have to eat it. The best thing that could happen for farmers here would be that the price of artificials and feeding stuffs should drop down to £5 or £6 per ton. One more remark on the article under review. Mr Prout is perfectly correct when he says that: "The farm servant is better off than the tenant, and the tenant is better off than the proprietor." If I was presented with a property, tomorrow, the first thing I would do would be to sell it at whatever I could get, and save myself from the ruin that is falling heavily on all proprietors with the present iniquitous land taxation.

Now with regard to

FREE TRADE IN HOLLAND,

Holland is an exporting country and should, therefore, be a Free Trade one. Britain is an importing one and should be for Protection. When I was in Australia we exported everything and mostly to Britain, consequently I was strongly in favour of Britain being Free Trade so that we could dump our surplus down on these shores. But times have changed since I took up my residence here, and I am selfish enough to want protection against the dumping policy of other countries. The Hollanders do most of their trade with Britain, so they naturally are pleased to let the few things into their country free, so long as Britain allows their huge supplies in here free. I am not very particular one way or another, but I do think,—although you may think it selfishness on my part,—that as such luxuries as tobacco, tea and sugar are to be taxed, other things, equally luxurious such as wheat, beef, oats and butter, should also be taxed. Why are the litters of the soil to be the only ones to give their labour for nothing,—unless you count the doctors also, whom Lloyd George says should be glad to give more than they are already giving. Britain is the only real market in the world, and all other countries dump their produce into it, without paying for taxes, upkeep of markets and rates of all kind. I had a letter from a New Zealander in which he says that although he would be sorry if Britain became Protection, as it would take away a lot of their profit, still he cannot be blind to the fact that 5s per quarter on grain, or per cwt. of butter, &c., &c., would be a great advantage to British farmers, and would have to be paid by them in New Zealand for the benefit of getting a market for their goods. The Religious controversies in Holland do not trouble me, but the present system of unchristianizing our country which our Government has taken up, will soon put churches and parsons out of fashion. You note how the Hollanders depend on their own farmers for cheap food, here the Government both Unionist or Radical do all in their power to drive farmers out of the country, and this Insurance Act has put just a head on it for farmers are working with less hands, those who have got the sack join the ranks of the unemployed, and are going abroad by the hundred thousand. And lastly—you will be glad!—"The adoption of Protection by Britain would be a serious matter on the continent." Why? because we would get the money that they are getting at present. They must sell their surplus, so would have to pay us the duty to get us to take their goods. I have written far too much, but I am sorry to see my native land going into the boiling pot; to see the men who have been put into parliament to protect and look after the country, making poor hard-working people buy stamps to provide

£400 to each of these, and forcing an act on them against all their wishes, and instead of giving any *quid pro quo*, are using the money to provide billets—useless ones—to those that will give votes in return. My letter reminds me of George McGregor, who used to say, when any one wrote him a long letter, "Why don't you boil down what you have to say." Them will be your sentiments; so I will finish and remain,

"COSMOPOLITE."

THE FUTURE OF RUBBER.

A Favourable View of the Outlook.

[by an expert correspondent.]

The recent cheerfulness in the Rubber share market is very likely to be followed by a more pronounced improvement in prices during the autumn. Statistics seem to favour at least a continuance of good prices for raw rubber, owing to the unforeseen rate of expansion in consumption. According to Messrs Hecht's report, the twelve months to 30th June showed an increase of about 25,000 tons in the world's consumption, while production increased to only about half that extent. This goes to confirm Mr Lampard's opinion that before the end of 1912 there will be a considerable shortage in the commodity. But it seems that this may be only the beginning of a long and indefinite period of increasing shortages.

A year ago it was thought that a 10 per cent. annual increase in consumption was a reasonable allowance to make, and upon that basis it appeared that the Mid-East would, within a very few years, more than make good this call upon production. (The rest of the world seems unable to respond appreciably, the boom prices of 1910 having had practically no effect in increasing the supply of wild rubber.) Hence it was assumed by all the experts (the present writer among them), and the idea was embodied in all estimates of future profits, that the price of rubber would begin to recede at once, and that its value would decrease about 1s a year until it made Brazilian rubber unprofitable at 2s 6d to 3s per lb. After that the decline was to be slower, but no one doubted that there would still be a decline, and that, perhaps about 1918, we should see a level of price at which only moderate commercial profits would be the rule for plantation rubber. The enormous expansion of the motor industry now appears to have entirely upset these calculations, and if the increase of consumption should be maintained at anything like the 33 per cent. of 1911-12, all the plantations would be hopelessly outpaced, and the shortage would increase year by year instead of diminishing. Even if the consumption should increase by 25 per cent. per annum instead of the 33 per cent. shown for last year, and allowing for a further 100,000 acres to be planted every year, it would be found that by 1920 the shortage would be enormous, so large, in fact, that one can hardly imagine it possible to overtake it at all, unless some new field with practically unlimited labour can be found. No one can foresee the limit of tyre consumption, but at present the contingency just suggested seems to be at least as likely as any other.

This prospect, in conjunction with the excellent returns lately chronicled by nearly all the plantations, will lead investors to look forward to very encouraging dividends, and not for this year only. Many of the best estates, which were planted in the three or four years preceding the boom, are now entering the dividend-paying stage, and it will soon be apparent that their shares, and not those of the older companies which have hitherto claimed principal attention, will give the best return upon their present market value, not only if we find the price of rubber maintained or increased, but whatever may be the future course of the Rubber market. Indeed, if we should have ascending instead of descending values for the product, the share list of today will form curious reading a year or two hence.

D. A.

—*F. Times*, Aug. 21.

A TROPICAL COLLEGE OF AGRICULTURE.

The question of establishing a properly-equipped College for Tropical Agriculture has been long under discussion, and perhaps no one has done more to keep it before the public eye than Mr. Hamel Smith, Editor of *Tropical Life*.

The young man who comes out to the tropics after a training at an English Agricultural College is none too well equipped for the work before him, and finds it necessary, on his arrival in a colony, to serve a term of apprenticeship (vulgarly called "creeping") before he can feel at all qualified for estate management in tho tropical sense of the term. But this does not by any means mean that his agricultural education is complete, for he has still had no opportunity of acquiring the technical (that is scientific) knowledge which he can only obtain in a tropi-

cal college, and which will stand him in such good stead in his every day experience as a "planter."

Neither great Britain nor the United States of America can be said to have

A TROPICAL DEPARTMENT,

worthy by the name, attached to any of their Agricultural Colleges.

We gather from what has appeared in the English press and the West Indian Magazine that Trinidad is beginning to be looked upon as the locale of the future Tropical College of Agriculture, but surely it is not for a moment to be supposed that a West Indian College will serve the needs of the Eastern tropics? In many points there is no coincidence between the West and East Indies, and even if this fact were disputed, is it to be imagined that one institution will suffice for both hemispheres?

The selection of Trinidad need not affect the question of a College of Tropical Agriculture for the East and when we come to consider the matter closely we must naturally

ASSOCIATE CEYLON

with such an institution.

Already we are getting on with our equipment, in respect of the necessary staff, which is at the present moment perhaps more suitable to the requirhments of tropical agriculture than ever before. With a thoroughly practical agricultural director, who strikes us as being as conscientious as he is energetic, backed by an able staff of specialists, both local and foreign, it is only a question of development, and that in turn is only a question of means.

Now that it has practically been decided by Government to start an Agricultural College in connection with

THE NEW DEPARTMENT OF AGRICULTURE,

what is wanted is a tropical planting side to this institution; and at the present time, when we are, so to speak, riding on the crest of agricultural and commercial prosperity, it is surely only a matter of asking in order to receive donations for such a department, where the planting student will be able to obtain his training on the spot. We feel sure that the new Director of Agriculture will not "omit the tide," but will take advantage of the spirit of liberality which is abroad, to appeal to those who can help, to assist in the founding of an institution which is calculated to foster the planting industry and prolong the good fortune which its members enjoy.

AGRICULTURE IN PERAK IN 1911.

The Perak Administration Report for 1911, says the Para rubber export was more than doubled, amounting to 40,880 pikuls, against 19,063 that left the State the previous year.

"The area under cultivation in coconuts was 73,120 acres as against 66,088 in 1910, practically the whole delta between the Bernam and Perak rivers has been alienated for this form of cultivation and is being opened rapidly. In a few years, this vast plain, which was dense jungle four years ago, will present an unbroken field of coconut palms.

Of the 262,487 acres of land alienated for the cultivation of rubber at the end of the year, 124,681 acres reproted to be opened and 31,532 acres to be producing. The total crop for the year was 6,041,763 lb. as against 2,962,218 in the previous year. Estates have been opened in every district in the State, and the year was characterised by steady development and maintenance of opened areas after the rush for new land and the promotion of companies prevailing during 1910. The whole face of the country, as seen from our main roads, has been transformed from virgin forest, to the monotony of miles of rubber trees, and a path of jungle along our cart-roads will soon be the exception rather than the rule of less than ten years ago.—*Malay Mail*, Sept. 4.

SPANISH CUSTOMS DUTY ON TEA, COFFEE, COCOA AND SPICES.

PROPOSED INCREASE NEXT YEAR.

Art. 6 of Bill proposes to increase temporarily by 10 pesetas per 100 kilogs, net weight (4s. 0¾d. per cwt) the Customs duties on articles falling under the Nos. 635 to 643, both inclusive, of the Customs Tariff. The following articles are affected:—

635 Cocoa in the bean, not roasted, and cocoa husks, if the produce of Fernando Po, and imported directly therefrom.
636 Ditto, ditto, of other origin.
637 Cocoa, roasted, ground, cocoa in paste, and cocoa butter.
638 Coffee in the bean, not roasted, if the produce of Fernando Po, and imported directly therefrom.
639 Ditto, of other origin.
640 Coffee, roasted, ground; chicory, roasted or not, and other similar products.
641 Cinnamon of all kinds, and imitations thereof.
642 Pepper, cloves and other spices, and imitations thereof.
643 Tea and imitations thereof, and "yerba mate" (Paraguay tea).

This surtax is to be levied in gold at the same time as the ordinary Customs duties. It is not to be levied on the articles concerned which, included in a manifest or under direct bill of lading visé by a Spanish Consul, are despatched to Spain before the 1st January, 1913.—*Board of Trade Journal*, July 4.

ELEVEN GOLD MEDALS

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RUBBER CULTIVATION IN THE F.M.S.

REPORT OF DIRECTOR OF AGRICULTURE FOR 1911.

The following on Rubber cultivation is from the 1911 report of Mr Lewton Brain, Director of Agriculture, F.M.S. On the question of

MANURING OF RUBBER

Mr. Brain is of the opinion that while in certain cases manures may be required, as shown by backward growth or starved appearance of the rubber trees, he is of the opinion that it is not so in most cases. So-called "experiments" have been carried out and have been quoted as proving enormous gains from manuring; these usually consist in putting manure around certain trees and digging it in; then if any improvement is noted, it is attributed to the manure, whereas it is equally likely to be due to the cultivation.

PRUNING.

In nearly all old rubber, particularly where the trees are closely planted, a certain number of the lower branches are gradually starved out and die; they thus become a source of weakness to the tree and serve as points of entry for fungi and insects. During the dry weather this tendency was much intensified, and on some estates numbers of these branches died so rapidly that the leaves had not time to fall, but remained withered on the dead shoots. No bad results followed where the pruning was quickly and carefully carried out, although at the time the appearance of the fields was somewhat alarming. As a general rule, all these weak shaded branches should be removed before they begin to die. The pruning should be done very carefully; the branch should be cut off smooth, right down to the main stem, and no splitting permitted. The wound should be given a good coating of coal tar which should be renewed as frequently as is necessary, until the wound is healed over.

TAPPING.

The tapping of rubber trees is, I think, showing improvement generally, both as regards quality and quantity of bark removal. As regards quantity of bark removed a conservative procedure is more and more coming into favour and very few estates now allow for less than four years' renewal of the bark. The systems by which this is brought about vary considerably, single V's, double V's, one quarter half-herring bone, alternate quarters, every day and alternate day tapping, all find their advocates, and probably the exact system followed is not of primary importance. Some estates are adopting systems allowing for even more than four years renewal of bark while I still find a few that are removing one half their tapping area each year; the condition of these trees after the second round of tapping must certainly be very poor.

A research is being carried out by Mr Bateson, Assistant Mycologist, on the depletion of the food reserves of Para rubber trees by tapping and other natural demands on the vitality of the trees.

The quality of tapping, by which I mean the number of cuts to the inch and the proper depth of the cuts, is a subject on which planters as a whole are keenly interested. Twenty cuts to the inch is a very good average, although a good many more than this are claimed by some estates. The cuts should, of course, be sufficiently deep to tap all the latex, and yet must avoid injuring the cambium, which lies immediately beneath. When it is considered that a good cooly will do over 1,000 cuts per day, besides the incidental work of bringing in his latex, washing cups, pails, etc., it is evident that it requires very skilled labour to avoid all mistakes.

LACK OF SUPERVISION.

When bad tapping is met with it is usually traceable to one of two causes. Either the labour force is new or is always changing, resulting in unskilled tappers being employed, or else there is insufficient supervision of the coolies.

When wounds are made in tapping they should be treated, as suggested in my report for 1910, by painting them over with coal tar. This is done on some estates as a routine measure, with excellent results. The tar must, of course, be of the right consistency, sufficiently fluid to be painted on (a stalk of rubber leaf makes a good brush) but no fluid allowed to run down the bark. The tapper should be made to paint all the wounds on his own trees; he does not like it, as it draws attention to his mistakes, but, when persevered in, the system is of great advantage from this point of view alone, besides achieving its primary object, which is to assist in getting a clean growth of new bark over the wound.

MANUFACTURE.

Crepe and smoked sheet still balance one another as the favourite forms in which plantation rubber is exported. Towards the end of the year there was practically no difference between the prices obtained for these two forms of rubber. I still retain my preference for smoked sheet over crepe, though, undoubtedly, much of the fine crepe, produced in the Federated Malay States is excellent rubber. A great deal of extra work on estates has been caused by the demand in the market for a very light coloured crepe. This is, I think, quite an unnecessary refinement; and the exact shade of colour of fine crepe has really very little bearing on its quality. When this is realized a good many Managers will be saved a large amount of time and trouble involved in grading their rubber to a dozen or more different shades of colour, the whole of which are of one perfectly uniform quality.

DRIERS.

A point that should be considered by many estates is the advisability of installing arrangements for more rapid drying of their rubber, particularly where thickish crepe is manufactured, and where large quantities have to be handled. There are some special hot air driers on the market which appear to work successfully. But even a simple arrangement of fans to keep the air in motion, combined with, possibly, a heating or drying arrangement for the incoming current, should be easily installed and should reduce the time taken in drying immensely. This would result in a smaller space being required for stores, less money tied up in the form of wet rubber, and generally cleaner rubber. With a view to testing the actual commercial value of raw rubbers produced in the country, the purchase of an experimental vulcanizing plant has been approved for 1912.

TESTS.

Apart from the special research on methods of coagulation and curing, a large number of rubber samples have been received from various estates, showing certain defects, with requests from Estate Managers for advice.

The principal defects found in such samples were: (1) air bubbles, caused by using too concentrated solutions of coagulant and improper mixing; (2) "Spot" diseases due to the fungi or bacteria, which have been investigated by the Assistant Mycologist, Mr. Bancroft; (3) tackiness, due to exposure to the heat of the sun or other heat; (5) discolorations, due, usually, to oil on the rollers from the bearings.

A small experimental smoke-house of the Kent "hop drying" type has been erected during the year and proved very useful.—*Pinang Gazette.*

PESTS AND DISEASES OF RUBBER IN THE F.M.S.

REPORT FOR 1911.

In his report for 1911 the Director of Agriculture, F. M. S., makes the following interesting remarks:—

INSECT PESTS.

Among the pests of rubber, white ants (*Termes gestroi*) continue to require attention but they are, undoubtedly, on the decrease. It would be interesting to have figures on this point. At a rough estimate the Entomologist estimates that over similar areas the number of trees attacked by these insects, now, as compared with the number of 1907, would be 60 per cent. less. This reduction is due to two reasons: firstly, planters have now a systematic method of dealing with these insects; secondly, because *T. gestroi* cannot maintain the same rate of increase on older estates where felled wood has rotted. The systematic campaign against these insects on all young estates prevents it increasing in such numbers, as it did in former years, when there was no systematic treatment. A few planters complain that after treating young trees with the fumes of arsenic and sulphur or red-hot charcoal the trees die. This may be due to the presence of root fungus, for there is, no doubt, that in a large number of cases *Fomes semitostus* is the original cause of the trouble when white ants are present. There is no reason why the fumes should produce a harmful effect upon the tree. Too great a heat may be harmful. Our own experiments have been entirely successful.

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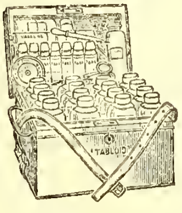

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A minute beetle (*Xyleborus parvulus*) of the family *Scolytidæ* has from time to time been reported as attacking rubber. These reports show that the insect is widely spread. Many planters are acquainted with the shot hole-borer of Ceylon which is a closely allied species attacking tea.

Many inquiries are received in connection with this beetle and the following notes by the Entomologist will, therefore, be of interest.

If extensive pollarding is resorted to, *Xyleborus* will, in all probability, make its appearance, almost certainly should the wounds not be tarred; careless tarring will also enable this insect to gain an entrance.

BORERS.

It is common knowledge with planters that should a tree die, either from root fungus, *Diplodia* or other causes, it will soon become full of borers. There are two or three kinds, but commonly of two only. One is minute, dark-brown (*Xyleborus*), the other nearly a quarter of an inch long, light-brown and cylindrical (*Platypus*). The former has attracted attention, because it has been noticed occasionally to enter healthy trees. Frequently it is found boring into trees where latex is still present, but these trees are usually diseased.

The only instances where I have found apparently healthy trees attacked is on those estates where pollarding has been indulged in freely or where trees have been weakened from various causes. Here two or three instances were found, a few beetles having succeeded in gaining an entrance just beneath the lateral branches. On the trunk of the tree were numerous beetles caught in the latex exuding from the wound made in their attempt to reach the wood. If in large numbers, and they may be when a tree is badly diseased although not dead, their presence is apparent from the dead dust at the base of the tree and the small cylindrical lengths of compressed wood dust projecting from the minute holes in the tree. Their presence may sometimes be detected by a tear of latex having its origin at a small hole, or a coagulated drop of latex covering a small hole, but neither of these are definite indications.

CRICKETS.

The cricket, *Brachytrypes achatinus*, has given trouble to many rubber planters. It confines its attacks to young clearings, and its effects are similar to those caused by the beetles (*Xylotrupes*). On some estates the damage caused by this insect has been extensive and thorough.

During the day the cricket remains in burrows made by itself, at night emerging and nibbling the shoots of young rubber stumps. So constantly does it continue its work that over a large area stumps of eight months' old bear no green leaves. By repeatedly sending forth new shoots a large excresence is formed which may be on the stump or on one of the larger shoots at the point where smaller shoots have persistently been nibbled off. Several hundred acres are sometimes attacked in this

way. The cricket prefers sandy soil, but this is by no means the only soil it frequents. Dense clay soil is also suitable and occasionally peat will harbour these insects. Many remedies have been tried and on hilly land carbon bisulphide was found effective. The best remedy is, however, the same as used for the beetle.

NIPPING BEETLES.

In the past year several estates in the Federated Malay States have had great trouble in their new rubber clearings through the young shoots of the stumps being repeatedly nipped off in much the same way as is done by cricket *B. achatinus*. The Entomologist reports that this damage is due to a species of beetle closely allied to *Xylotrupes*, and in a very few instances the coconut beetle, *Oryctes rhinoceros*, is responsible for some similar work. The former insect will invade a clearing and cause more extensive damage than the cricket.

In places where this insect occurs in abundance the damage caused by it is very serious, some estates having considered the advisability of abandoning clearings where the young shoots have repeatedly been nipped. The insect is however, easily dealt with, and the discovery of the remedy is due to Mr E V Carey. The work of this beetle is fairly characteristic. Shortly after the young stumps commence to shoot these are nipped sometimes near the top, in other cases near the stem ; at first a stump here and there if affected, and usually no notice is taken of an occasional loss such as this. The number of stumps affected in this way will rapidly increase, and a clearing of 500 or more acres may have 90 per cent of the shoots nipped. Fresh shoots appear, but these are rapidly eaten down, and this continues until the stump dies. Supplies suffer in the same way, and a clearing of 12 or 18 months without a green leaf may sometimes be seen ; most of the stumps in such a clearing are quite useless as they are malformed.

On clearings that have been examined for this pest it has been noted that on flat land, and often in the vicinity of peat, most damage is done. Shoots near the ground are preferred, but they are by no means the only ones attacked; some at a height of four feet from the ground are nipped.

The difficulty with this insect in the original instance was to find the culprit. An examination of a clearing in the morning revealed many shoots freshly nipped, but no sign of any insect. Crickets were not present. On a few occasions searches have been made throughout the night until daybreak, but with no success. It was eventually found by catching one of the insects in an older clearing, and an examination of the mouth parts showed coagulated latex adhering to its mandibles. The neighbouring young clearing was badly affected. The pest often rests in these older clearings during the day, commencing work at night. It often frequents trees about a year old, resting beneath the leaves at the crown. This is especially the case where trees of this age are distributed through an attacked clearing. A few adult beetles have been found underneath logs and at the roots of nibong stumps where it is probable they breed.

On account of the length of this insect's legs it has considerable difficulty in climbing seedlings, while stumps form an admirable means of ascending to the point at which the shoot emerges; it is practically certain that the shoots are nipped while the insect clings to the stump. I do not mean to say that seedlings would be immune, but stumps are certainly more suited for this insect's attacks. The legs of this insect are often covered with coagulated latex which is due to the spines piercing the young bark and the latex flowing on to them. With regard to remedial measures it has been found than excellent results are obtained by the use of cylinders of newspapers placed over the stump.

REMEDIAL MEASURES.

One sheet of an ordinary daily newspaper circled to form a cylinder about five inches in diameter and pinned together is placed over the stump. About two inches of one end of the paper is turned down, and this end is placed uppermost. This precaution prevents the rain from tearing the edge. After placing this shield over the stump a little earth is placed around the base, and on the inside are placed three sticks which support the cylinder. In one case there were very heavy rains for about six weeks, and only three or four per cent. of these shields were destroyed. The remedy is very simple, inexpensive and entirely effective when properly carried out. In an attacked clearing no stumps should be left uncovered. The cost of this remedy should not exceed $1·20 per acre, and on most places 60 cents would be sufficient.

Collecting the beetles, while not absolutely necessary, is an additional precaution. In some places as many as two or three hundred are collected each day. They are to be found, as has previously been pointed out, on the young rubber trees. To collect them coolies go round and shake these trees ; the beetles will fall to the ground, and can be gathered. This work should be done in the early morning. Crows are useful scavengers in regard to this pest. An examination of one of these birds showed that it had been feeding on these beetles. The large wing covers are discarded, but the spined legs, the horned head and other hard parts of the body as well as the soft are eaten.

SCALE INSECTS.

A scale, *Lecanium nigrum* has been reported many times as attacking rubber. Its distribution is general. It is found chiefly on trees from six months to two years, although an instance recently has been met with of some 2,000 trees about four years' old which were very badly attacked by this insect. As a general rule, young trees are attacked, and no serious damage is done. Perhaps 20 trees may be affected, seldom more. Such a large number as 2,000 is at the present time an exception. The insects attach themselves to the leaf, and have the appearance of a scale. They are usually near the veins, and may easily be seen with the naked eye, the largest over ⅛ inch

long. They are dark-brown or black and oval in shape.

Leaves which are attacked by this scale are discoloured by a blackish or brown fungus which follows upon this insect. The fungus-hives the sugary exudation of the scale.

Trees which have this scale upon them often swarm with ants, whose habit it is to live in close connection with many species of scales on account of the exudation from them being agreeable to the ants. Attacked trees may sometimes be detected by the presence of ants.

In cases where large areas are affected it is advisable to commence catching the pest immediately after wintering. It is easier to deal with it at this time as large numbers die at the wintering period. Where small areas are affected it often happens that there is no return after wintering. Should spraying prove necessary either kerosene or resin would prove effective.

DISEASE OF RUBBER.

The following diseases and conditions of Para rubber have received attention from the Mycological staff during the year. Owing to Mr Bateson being on duty in Krian the greater part of this work has fallen to Mr Bancroft, Assistant Mycologist.

ROOT DISEASES.—(i) The disease caused by *Fomes semitotus* still constitutes the most important disease of the plant and continues to cause a loss of trees in young plantations. It has proved itself amenable to methods of treatment by isolation, sanitation of diseased trees, application of lime. The majority of estates are free from the disease among their old rubber. It has been shown in the investigations that one of the most important considerations in connection with the treatment of the disease is the application of an efficient system of drainage. The trenches which were used for isolating the diseased areas were, in several cases, found to be too small, and it was recommended that they should be made to include, not only the trees which were attacked, but the next row of trees beyond, so that a large area might be marked out for treatment. After studying the number of plants on which the fungus occurred it was concluded that a selective method of stumping would not be practicable as a preventive measure. The observations on the disease in the field appeared to justify the conclusion that only under exceptional circumstances, is the damage done by the fungus sufficiently great to warrant the complete removal of the timber from the land; while there is sufficient evidence to demonstrate that the disease can be exterminated by treating infected areas as soon as they are discovered.

(ii) The "brown root disease," caused by *Hymenochæte noxia*, occurs only in small quantity in the Federated Malay States. It was recorded on fifteen estates in different planting districts during the year, a few trees usually being attacked on each estate. It has been found that the fungus grows very slowly, and does not spread through the soil even under damp conditions; and consequently its action is usually limited to a single tree. Isolation by trenches and liming, accordingly appear to be unnecessary, providing that the dead roots are removed. The disease is consequently much cheaper to treat than that caused by *Fomes semitostus.*

No other root diseases have been found to occur in this country. *Irpex flavus*, which has been said to cause a root disease of the plant, has hitherto been recorded only as a saprophyte on dead wood. This fungus has been said to kill clove trees in Malacca and also to cause a root disease of coffee. The fungus known as *Holicobasidium mompa*, which is said to be a root parasite on Para rubber, has not been met with; it has possibly been confused with *Hymenochæte noxia*, the "brown root fungus." A root disease reported from Ceylon as being due to *Spœhrostilbe repens* has not been recorded in this country.

STEM DISEASE.—(i) The "die-back disease," caused by the *Diplodia* form of the fungus, *Thyridaria tarda*, has been met with commonly during the year. Its action is limited to a branch or a tree here and there. The fungus occurs commonly on dead branches, whatever may have been the cause of death; and consequently the death of branches from shade or natural causes is frequently attributed to it. The fungus must enter through a dead or wounded part of the plant and such fungi are not usually a virulent source of disease. Following on another fungus, which attacks the young plants and which will be mentioned later, the die-back fungus has been responsible for some considerable damage. The methods of treatment are the sealing of wounds, the removal of attacked branches and the establishing of a vigorous growth of the plant. Spraying as a method of treatment is entirely unnecessary.

(ii) The death of the tips of the shoot of young trees has been found by inoculations to be due to a fungus, which appears from its characters to be indistinguishable from *Phillosticta ramicola*, previously described from Ceylon but not regarded as a parasite. It has been recorded on several estates and the extent of the damage done is indicated thus:—

Date of record.	No. of trees.	Area.	Age of trees
15-7·11	35	4 acres.	6 months
20-7-11	6	2 acres	15 months
20-7-11	2	(Adjacent trees)	18 months
25-8-11	36	1 acre	2 years
20-10-11	4	(Not known)	(Not known)
12-12-11	50	5 acres	18 months

The disease was first observed in July. The fungus attacks only the upper parts of the branches, usually the topmost 12 or 18 inches; but sometimes the uppermost three feet may be affected. The "dieback" fungus follows readily after this preliminary attack and may kill the tree to its base. An area of four acres on which 35 trees were affected was treated by cutting off the dead parts and burning them, sealing the wounds with a mixture of coaltar and clay and spraying every tree in the whole area with a boiled lime-sulphur mixture as a

preventative. The spraying was repeated at the end of six weeks. Cases of the disease appeared for the first two months after the treatment was applied but there was no further record of any cases in the area up to the end of the year. Another area of five acres is under treatment, but there is hitherto no record of the action of the treatment.

(iii) The "pink disease," caused by *Corticium salmonicolor*, has been reported from ten planting districts. It is, however, only present in small quantity, and there has been no apparent necessity to apply a preventive method of treatment, in order to arrest the spread of the disease.

(iv) A "sooty mould," *Limacinula javanica*, has been recorded as following on a scale insect, *Lecanium nigrum*, on the leaves of the plant. The fungus has been known on coffee in Java. Its presence depends on the insect.

(v) The "thread blight fungus" was recorded on two estates. It does not appear to be present in any appreciable quantity and the burning of the branches has been sufficient to deal with it.

(vi) A silvery white fungus appeared on the bark of trees on one estate. It appeared to do no damage to the plant, but merely to disintegrate the dead bark. The trees were flooded during certain times of the year, and the fungus appeared at these times near the base of the trees. It was recommended that the trees be painted with a lime-sulphur mixture ; since this mixture has been found to be effective with fungi of that nature.

Leaf and Bark Diseases.

Only two have been recorded—viz., *Phyllosticta hevea* and *Pestalozzia palmarum*. The damage done by these two fungi is very small, and even in the nurseries it does not appear to warrant the application of a method of treatment.

Several effects of somewhat different kinds have been noticed on the bark of the trees. The commonest is that in which areas of the bark die and fall away, leaving large wounds, consisting of the exposed woods surrounded by a lip of renewing tissue. In such cases a definite recovery takes place, and the wound is healed. During the early part of the year the death of the bark on the newly-tapped surface was particularly common on one estate, where over 1,500 trees were thus affected. Investigations failed to associate the effect with my micro-organism and the trees eventually recovered, tapping operations having been suspended. It is probable that this effect was due to the collecting of water on the newly tapped surfaces. A similar occurrence in Ceylon had been previously attributed by Petch to the same cause.

Another type of death of the bark occurred in three trees on one estate. The bark became separated from the wood by the death of the cambium and could be removed in large masses. The trees were about five years old. There was no evidence of any root disease. An examination of the recently dead tissues failed to show the presence of any organisms. The trees were removed and burnt, so there was no opportunity of studying the progress of the disease.

The bark troubles require careful investigation, and it is proposed to devote some attention to them during the coming year.

Shoots.

The death of the top shoots of the plant has been fairly commonly met with. It occurs on exposed situations and appears in these cases to be due to wind, or it may occur on badly drained land, when it has been attributed to deficient drainage. The exudation of tears of latex from the branches is commonly caused by wind. The bending of the branches produces a splitting of the bark, and the latex is thus exuded from the cracks. A similar occurrence is said in some cases to be due to the pecking of the branches by birds. Bleeding is not uncommonly also associated with the "pink disease."

Malformed shoots, which take the form of strap-like flattened structures, have been frequently met with. The proportion of trees showing these malformations is under one per cent. They result from the fusion of stem and leaves instead of the independent development of these two organs. In some cases the structures are large and resemble a stag's antlers. If the fasciated branch is cut off or the tree pollarded it will frequently throw up a normal shoot. The nodular masses, which originate as small pea-like bodies on the trunks and may finally develop into large outgrowths frequently render tapping impossible. Such trees as are badly burred are frequently cut. The greatest damage from burrs is on old trees which have been badly tapped in previous years. A certain number of trees, however, develop burrs on the untapped parts or before tapping has been commenced. The percentage of these latter trees is, however, not usually greater than one per cent or two per cent.

Spotting of Prepared Rubber.—Considerable time was given to investigations as to the causes and methods of treatment of spots on prepared rubber. The result of the investigations have shown that the spotting is usually due to the growth of micro-organisms in the rubber. The organisms which have been found to cause spotting are : *Bacillus prodigiosus*, *Monascus heterosporus Mycogone* sp. and *Spondylocladium* sp. The first of these is a bacterium, and the others are saprophytic moulds. The bacterium occurs in top and pool water, and consequently the infection may be expected to proceed primarily from this source. The infection from the fungi may be expected to be caused by the transference of the spores which are capable of being air-borne. The rubber may be inoculated before or after coagulation. The investigations as to the prevention of the spots showed that by rapidly drying the rubber the spotting could, for the most part, be prevented from occurring. The application of antiseptics and solvents did not give satisfactory results. The work was nearly completed at the end of the year.—*Pinang Gazette*.

COCONUTS IN THE FEDERATED MALAY ESTATES.

The Inspector of Coconuts estimates the total area under coconuts in the Federated Malay States at, approximately, 142,774 acres, an increase of 12,430 acres or about 9½ per cent. over the total for 1910. The area in several States is as follows :—

Perak	... ...	73,120 acres.
Selangor ...	...	33,355 ,,
Negri Sembilan	...	19,584 ,,
Pahang ...	...	16,715 ,,

It is gratifying again to record a steady increase in the area under this valuable and reliable crop. From the area now under cultivation the Inspector of Coconuts estimates, taking an average of 40 nuts per tree, that there will he produced 1,100,000 pikuls (65,500 tons) of copra, provided that the whole of the nuts were converted into this products. The by-products also should eventually he used on a much larger scale for the manufacture of coir matting, rope, etc. During the year large areas have been taken up in Perak and Selangor by European companies for the purpose of coconut cultivation.

The Commissioner of Trade and Customs has kindly supplied the following figures giving the export of copra for 1911 from the four States :—

Perak ...	...	102,907 pkls.
Selangor ...	...	20,425 ,,
Negri Sembilan	...	924 ,,
Pahang ...	...	1,808 ,,
Total	...	135,064 ,, or 8,000

tons, approximately.

In addition to this, the Federal Oil Mills at Kuala Selangor purchased locally 20,236 pikuls. Compared with last year the export shows an increase of 9,294 pikuls or about eight per cent.

The Inspector of Coconuts states that the average price paid for good quality of copra during the year may he taken at about $10 per pikul, and it would appear, from the present position of the market, that good prices are likely to be maintained for some time. The total value of the copra produced may be taken as, approximately, $1,553,000.

The copra exported from European estates is stated by the Inspector of Coconuts to be of good quality, but he regrets not to he able to report any improvement in that manufactured by natives, especially in Kuala Selangor district. This poor quality is chiefly due to the use of immature nuts for the manufacture of copra.

With regard to pests, the Inspector of Coconuts reports that beetles gave most trouble in Matang, Larut and Krian. Immediate steps were taken to deal with these and at present very little damage from this source is being done to the trees. He states that far more damage is done by rats, pigs and bears, the last of which destroyed over 1,000 trees in Lower Perak.

While the native kampongs themselves are generally fairly clean, there are a number which are allowed to become overgrown with lalang and undergrowth. These harbour pigs and other pests to the damage of neighbouring cultivations. It would be to the benefit of themselves and cultivators generally and also, indirectly, to the Government if Malays could be persuaded to keep their holdings in a fair condition of good husbandry. In the Krian district great improvement is reported in the upkeep of coconut estates previously owned by Chinese but now in the possession of European companies.

General.—The questions connected with coconut cultivation have not received the attention they deserve in the Federated Malay States. There has been too much of the idea that a coconut only has to be planted somewhere near and it will grow anyhow. As a matter of fact, coconuts probably require even more careful attention than Para rubber trees. One point is clear and that is that conditions in Malaya are quite different from those obtaining in other countries—for example, the best plantations here are those on heavy clay land, while the usual idea is that coconuts thrive best in light soils. The majority of plantations here are on the flat low-lying lands near the coast.

It is evident that on such soils drainage is a most important factor and the possibilities of this should be especially looked into when the location of a proposed plantation is being selected. The main drains at least should be put in before any planting is done. A coconut is very intolerant of stagnant water and some of the native holdings suffer considerably through inattention to this point.

The question of the cultivation of coconuts is, to my mind, still an open one. Does clean weeding, as commonly practised on rubber estates, pay best ? It is better to keep clean an eight-foot circle round the trees and allow the weeds to grow (always excluding lalang) or should the intermediate land be ploughed or forked. Should a leguminous cover crop be grown? Is any manurial treatment required beyond an occasional dressing of bullock manure? I would not wish to pronounce on any of these points, though, from what I have seen, I would say that clean weeding is not so great a success with coconuts as it has been with rubber.—*Pinang Gazette.*

COTTON CULTIVATION IN MOROCCO.

At Sidi Ali, Scene of Recent Fighting.

H.M. Consul at Casablanca (Mr A M Madden, C.M.G), has forwarded a report on some experiments in the cultivation of cotton in that district. Twenty-two plants were raised from seeds obtained from Porto Rico and planted at Casablanca in a nursery with a chalky sub-soil. They were watered twice a month during the dry season, during which time they also received two dressings (*binage*). The average height was 1·30 metres (about 4 feet 3 inches) and the total yield was 350 grammes of clean cotton of good quality, equivalent to about 1,160 kilogs. per hectare (= 9·2 cwts. per acre.) Experiments were also carried out at Sidi Ali, about 50 miles from Casablanca on the Mazagan Road, a still better cotton being produced, but the experiments were on too small a scale to allow any definite conclusions to be drawn.—*Board of Trade Journal*, July 4.

APPOINTMENTS TO EASTERN RUBBER PLANTATIONS.

The following notes about the conditions of employment on Eastern rubber plantations may be useful to those whose ambitions lie in that direction.

The type of man most desired as a beginner is the public schoolboy who has led an active outdoor life. Some knowledge of agriculture is an advantage, but chief importance is attached to personal qualities. As regards age, the minimum limit is about twenty years, and the maximum about twenty-five years. Men beyond the latter age are not very willingly appointed. The disadvantages below the lower limit are unsettled physique and a smaller capability for maintaining discipline, while above the upper limit there is not only less possibility of successful acclimatisation, but difficulty in arranging the gradation of ages according to position, on which partly depends good feeling among the members of the staff.

There is no need to pay a premium for learning plantation work. During the first year of the engagement a rubber company pays to its assistants a salary that is sufficient, without extravagance, to maintain them in comfort. It may be £200 a year or a little less, with quarters and a native servant. The engagement will perhaps be for three years, with advances of, maybe, £25 in the second and third years. Looking to the fact that the young planter is really serving an apprenticeship, and is probably entering upon his duties in a state of almost absolute ignorance as to their nature, these terms must be counted fair. Bonuses are sometimes granted at the end of the financial year. Should the three-year period be objected to, a premium must be paid to a private planter. Holidays and home leave are given, medical attention is provided, and on large estates there are various facilities for recreation.

The tropical colonies differ in their relative advantages. Ceylon has long been under control by Europeans, and its reputation for methods of cultivation stands high. Further, the learner meets more often than in Malaya with a variety of products on the one estate or in the same district. Frequently tea is planted among the rubber, sometimes cocoa. Coconuts, for which the future is very promising, are found on many estates. Coffee has disappeared from Ceylon. In the Malay Peninsula rubber is more often found alone on an estate and covering large districts, and though coconuts, sugar, coffee, &c., are cultivated it is seldom that more than one of these accompanies the rubber. Many English companies have estates in Java and Sumatra, where there are openings for young Englishmen. Java resembles Ceylon in often having varied cultivations on an estate. Much coffee and tea are to be seen on the island. Sumatra largely resembles Malaya. Tobacco is a favourite product, and coffee also accompanies the rubber on some estates.

An important question is that of the maintenance of health. What are the chances of returning home in good health on retirement? A look at the numerous men living in London after years of planting in the Middle East is reassuring. Yet it must be pointed out that it is dangerous to be careless, for carelessness in matters of health is heavily punished in the tropics. No man who is not fit to begin with is allowed to go out to take up an appointment. The rubber company that pays his passage money naturally has an inspection made by a doctor with tropical experience.

To get a post as assistant, application should be made to one of the houses in London, Edinburgh, or Glasgow that have to do with the management of plantations. A letter may be efficacious if superior qualifications are possessed; but a call on one of the principals, even shou'd the applicant get no further at first than his private secretary, is much more likely to give satisfactory results. Employing an agent or advertising is absolutely unnecessary. —*Field* July 27.

TOBACCO INDUSTRY IN RHODESIA.

According to Mr. Stewart Richardson—says the "Empire review"—who superintends the operations of several tobacco-growing estates in Southern Rhodesia, the culture of tobacco in Rhodesia, which most people thought to be already a large and flourishing industry, is really only in its infancy. The rich low-lying portions of the country are expected, as soon as railway communication is opened up with the markets, to furnish double and even treble crops with a minimum of trouble. Down on the low veldt, in the great sandstone belts that traverse the country from Wankies to Lomagundi, are valleys where tobacco can be grown under ideal conditions. The soil for many years running will, in places, produce crops ranging from 900 to 1,500 lb. per acre, without any fertiliser whatever. Eventually, no doubt, as settlement proceeds, the low veldt will be tapped by one or more railways, and when that occurs the industry should make giant strides. Tobacco is now being successfully grown in the Phillipines, parts of Japan, Korea, Java and the Celebes. Ceylon rates very low in its cultivation owing largely to the sameness of climate.

PAPAYA OR PAWPAW.

I notice in the *Journal* of March 1st that Sir George Birdwood has written a short paragraph on the Papaya or Pawpaw. It is very largely grown in most gardens in this province, and many natives are now cultivating it. It is generally known here also as Pawpaw, though I have endeavoured to induce people to call it Papaya, but without success.

Where fruit, except bananas, and vegetables are scarce, we look upon the fruit as delicious, and it is a great digestive.

It may not be generally known, and perhaps Sir George Birdwood may not be aware of the fact, that by wrapping up a joint of meat in the leaves of the Papaya for two or three hours, the toughest becomes very tender.

The African kuku (chicken) even a champion sprinter of many years' standing, can be made in this way as tender as a spring chicken.

R. C. R. Owen,
Governor, Mongalla Province, Sudan.

—*Journal of the Royal Society of Arts.*

BANDARAGAMA GARDEN.